Asthma Surveillance Report

MONTANA
ASTHMA CONTROL PROGRAM

April-June 2010

Environmental Exposures and Asthma

40% of Montanan adults and children with current asthma have been advised by a health professional to make environmental changes in their home, at school, or at work to improve their asthma

Source: Montana Asthma Call-Back Survey

Environmental Triggers of Asthma Attacks

Exposures to substances in the home, school, and work environment can trigger asthma attacks. Avoiding environmental allergens and irritants is one of the primary goals of good asthma management.[1,2] Health care providers can facilitate the identification of personal asthma triggers by conducting an environmental exposure history for all asthma patients during a regular office visit.[3] Awareness of personal triggers, asthma action plans, and small changes in the patient's environment may reduce asthma symptoms and potentially reduce the number of hospitalizations and emergency department visits due to asthma exacerbations.

The Montana Asthma Control Program (MACP) seeks to improve asthma control in Montana, and believes that environmental exposure mitigation is a key aspect of improving disease outcomes. The Montana Department of Environmental Quality (DEQ) is also committed to supporting a healthy environment in Montana and provides tools such as the *Today's Air* website and the *Citizens' Guide to Air Quality in Montana*. The MACP and its partners will be drafting and publishing a consensus paper on environmental asthma triggers in Montana in 2010.

Assessing Environmental Exposures in Montana

There are few sources for data on asthma related environmental exposures in Montana. One available data sources is the Montana Asthma Call-back Survey (ACS), a telephone survey of non-institutionalized adults aged 18 and over. Participants are recruited from the Behavioral Risk Factor Surveillance System (BRFSS) survey if they indicate that they had or currently have asthma. Adults are called back and asked more in-depth questions about their experiences with asthma. This includes asthma symptoms, health care utilization, limitation of activities, environmental trigger mitigation efforts, education received, medications, and use of complementary and alternative therapy. During the BRFSS survey a child (age 17 and younger) is also randomly selected from the household and the parent/guardian answers questions for the child, including whether they have ever had or currently have asthma. Parents or guardians of children with asthma are then called back and surveyed about the child's asthma experiences. Montana has participated in this survey, which is sponsored by the Centers for Disease Control and Prevention, since 2006.

For this report, questions on exposure to common asthma triggers and actions taken to mitigate environmental asthma triggers among Montanan adults and children with current asthma[4] were estimated using concatenated data from the 2006, 2007, and 2008 ACS.

Indoor Air Quality and Triggers

In the United States, adults and children nearly 90% of their time indoors.[5] Household, school, or workplace exposures may exacerbate preexisting inflammation or change immune responses leading to an asthma attack.[1] There is some debate as to which environmental triggers are linked to asthma. In 1998, The Institute of Medicine convened a twelve person expert panel gather the evidence about indoor air exposures and asthma.[5] Their findings are summarized in Table 1.

Table 1. Evidence-Based Indoor Air Exposures that Cause or Trigger Asthma

Indoor Air Exposure	Cause of Asthma	Trigger of Asthma
Cat Allergen		3
Cockroach Allergen §	1*	3
Dampness Indoors or at Home		2
Dog Allergen		2
Dust Mite Allergen §	3	3
Fungi/Mold		2
Indoor Chemical Exposures		2
Nitrogen Dioxide (Gas appliances)		2
Secondhand Tobacco Smoke	2*	3

1=Limited evidence for association
2=Sufficient evidence for association
3=Sufficient evidence for causation
***=for children only**
§=Low public health importance in Montana

Some of the indoor asthma triggers that Montanans with current asthma report being exposed to are listed below (Table 2).

Dog/Cat/Other Animal/Insect Allergens

- Two thirds of adults and children have indoor pets
- 40% of children sleep with a family pet
- Over two thirds of adults and children have carpeting in their bedroom, which can trap allergens
- Nearly 7% and 10% of adults and children, respectively, have seen rats or mice in their home in the last 30 days
- Very few Montanans with asthma report seeing cockroaches in the home

Nitrogen Dioxide/Combustion Devices

- About 25% households use gas to cook
- Four percent of adults and 7.5% of children report using an unvented gas stove or fireplace in their home
- About 28% of adults report using a wood burning stove or wood burning fireplace to heat their home

Fungi/Mold/Dampness Indoors

- 10.4% of adults have seen mold in the last 30 days

Secondhand Tobacco Smoke

- About 13% of adults and children live with someone who smokes tobacco.
- About 22% of adults with asthma are current smokers (BRFSS, 2008).

Chemical Exposures

- No questions are asked about chemical exposures in the Montana ACS

Cooking with gas and heating the home with woodstoves generates gases and particulate matter that can exacerbate asthma. Domestic pets, rats, mice (domestic and pests), and mold can produce allergens that affect people with asthma and these allergens can be trapped in bedding and carpeting around the house. Secondhand tobacco smoke is an airway irritant that can exacerbate asthma. At sufficient concentrations, cleaning products and other chemical fumes may trigger reactions. Mitigation of these exposures in the home could decrease the frequency and intensity of asthma symptoms and increase the quality of life of some individuals with asthma. Because of high altitude and dry climate, exposure to cockroaches and dust mites are less prevalent in Montana and may not be of concern to people with asthma.

Table 2. Prevalence of Indoor Asthma Triggers Among Adults and Children with Asthma, Montana, 2006-2008

	Percent Adults	95% Confidence Interval	Percent Children	95% Confidence Interval
Use gas to cook	22.6	18.3-26.9	26.0	17.0-34.9
Use unvented gas fireplace or stove in home	4.0	2.2-5.9	7.5	1.6-13.6
Seen or smelled mold in last 30 days	10.4	6.9-13.9	4.0	0.2-7.8
Indoor pets	65.0	59.9-70.1	68.7	59.1-78.4
Pets in bedroom	51.0	45.7-56.2	46.7	36.7-56.7
Fireplace or woodstove used	28.4	23.7-33.1	16.0	9.5-22.4
Seen rat or mice in home in last 30 days	6.5	4.2-8.9	9.6	3.3-15.9
Anyone smoke in home	13.7	10.1-17.3	13.0	6.3-19.6
Carpeting in bedroom	73.5	68.2-78.9	67.6	58.3-77.0
Seen cockroach inside home in last 30 days	*	*	*	*

Source: Montana Asthma Call-Back Survey * =Data Not Sufficient for Calculation

Table 3. Methods to Avoid Indoor Asthma Triggers Among Adults and Children with Asthma, Montana, 2006-2008				
	Percent Adults	95% Confidence Interval	Percent Children	95% Confidence Interval
Use of an air cleaner or purifier in home	29.3	24.4-34.1	28.4	19.4-37.4
Use a dehumidifier regularly in home	10.9	7.9-13.8	8.9	4.4-13.3
Use a mattress cover	23.2	19.1-27.3	34.8	24.5-43.8
Use a pillow cover	22.8	18.4-27.2	34.6	25.3-50.0
Wash sheets and pillowcases in hot water	38.0	32.8-43.2	36.1	26.4-45.8
Use an exhaust fan in bathroom	66.0	61.0-71.1	67.2	58.4-76.0
Use an exhaust fan while cooking	56.3	50.8-61.9	71.0	61.9-80.0
Source: Montana Asthma Call-Back Survey				

Indoor Asthma Trigger Mitigation

To improve indoor air quality, nearly 30% of Montana adults and children with asthma report using an air cleaner or purifier in the home (Table 3). The most common asthma trigger mitigation efforts among Montanans are using an exhaust fan in the bathroom and while cooking. Children more frequently report using mattress and pillow covers than adults, and over a third of people report washing sheets and pillowcases in hot water. Other asthma trigger mitigation efforts by Montanans are listed in Table 3.

The Environmental Protection Agency (EPA) makes the following suggestions for avoiding asthma triggers indoors. For their full "Asthma Home Environment Checklist," visit www.epa.gov/asthma/pdfs/home_environment_checklist.pdf.

Dog/Cat/Other Animal/Insect Allergens

- Wash sheets and blankets once a week in hot water.
- Wash stuffed toys in hot water. Keep toys off of bed.
- Cover mattress and pillow in dust-proof zippered covers.
- Remove carpet from bedrooms. Wash throw rugs regularly.
- Consider keeping pets outdoors or limit the areas they can be in the home (i.e., not in the bedroom, not on furniture).
- Regularly dust surfaces and vacuum carpet. If possible, use a vacuum with a high efficiency filter. People with asthma should avoid rooms while they are being vacuumed or wear a dust mask if exposed to dust.
- Replace draperies with other wipeable window covering.
- Prevent insects from entering the home with pest management.*
- Replace wool or feathered bedding with synthetic materials.

Nitrogen Dioxide/Combustion Devices

- Ensure heating sources are properly inspected for cracks and damages and properly ventilate the room where a fuel-burning appliance/heating source is being used.
- If using a wood-burning stove, make sure that doors are tight fitting and only use aged or cured wood.
- If cooking with a gas appliance, turn on an exhaust fan or ventilate the room.

Fungi/Mold/Dampness Indoors

- Wash mold off hard surfaces with a detergent and replace absorbent materials affected by mold.
- Fix water leaks.
- Use exhaust fans when cooking, bathing, and using the dishwasher.
- Avoid standing water in plant containers, refrigerator drip pans, etc.
- Use a dehumidifier.*

Secondhand Tobacco Smoke

- Choose not to smoke in the home or car and do not allow others to do so.
- Take a smoke-free home pledge and post smoke-free signs to show the home is a "smoke-free" zone.

Chemical Exposures

- Limit the use of materials that emit strong odors or ventilate the home well while using products with strong odors (e.g., cleaning supplies, pesticide sprays, paints, air fresheners).

* May not apply to Montanans

Outdoor Air Quality and Triggers

Asthma can worsen when outdoor air quality is poor. Furthermore, exposure to air pollution may make a person with asthma more susceptible to indoor asthma triggers.[6] Common air pollutants are listed in Table 4.

Table 4. Common Air Pollutants and Sources

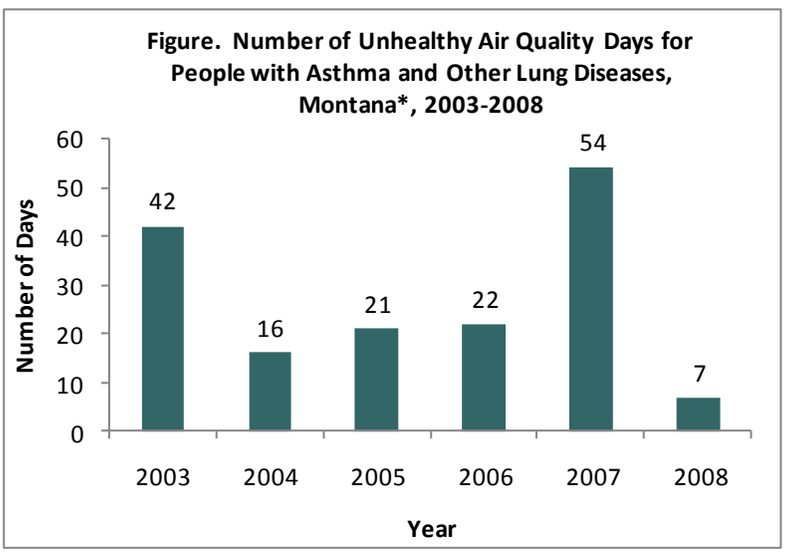
Air Pollutant	Source	Effect on Lungs[3]
Carbon monoxide*	Found in combustion fumes caused by motor vehicles, gas engines, burning charcoal and wood, gas stoves, lanterns, and heating systems	Not an irritating gas
Fine particulate matter (PM_{10} $PM_{2.5}$)	Caused by industrial and residential combustion, vehicle exhaust, forest and vegetation fires, and atmospheric reactions between gases and volatile organic compounds	Lower airway exposure from particulate matter causes an inflammatory effect, $PM_{2.5}$ penetrates even deeper in the lungs than PM_{10}
Nitrogen oxides (NO_x)	Found indoors and outdoors, produced during combustion, especially at high temperatures. Sources include motor vehicles, power plants, malfunctioning gas stoves, furnaces, fireplaces, and kerosene heaters	Increases bronchial responsiveness during exercise, decreases lung function in people with asthma at concentrations over 0.3ppm
Ozone	Product of reaction between hydrocarbon vapors and various nitrogen oxides (NO_x) reacting with sunlight	Decreased lung function and inflammation, short term effects include reduced FEV1 and FVC
Sulfur dioxide (SO_2)	Product of combustion of sulfur containing fuels like coal and petroleum. Volcano activity is also a source of SO_2.	Highly soluble and therefore mainly affects the upper airway, deep penetration to the lung may occur during exercise. There is a dose response effect seen with bronchoconstriction.

*Not likely to exacerbate asthma by itself

Harmful ozone forms at ground level in the presence of air pollutants, like nitrogen oxides, and sunlight. Therefore, ozone exposure is often worse on very hot days, especially in afternoons and early evening. Particle pollution is a mixture of solid particles and liquid droplets. These particles are easily inhaled and are caused by a variety of sources. High levels of particle pollution can occur any time of year, especially when weather is calm.

Air Quality Index

The Air Quality Index (AQI) is a scale used to quantify the amount of air pollution on a certain day and categorizes conditions to help determine if outdoor activities are recommended based on health concerns (Table 5). The index is based on daily ambient levels of the criteria air pollutants listed in Table 4. Montana DEQ collects hourly particulate data from various locations around the state and reports on air quality from these air monitoring stations. Theses data are available to the public on the 'Today's Air' website. Historical data show that between 2003 and 2008, the annual number of unhealthy days for people with asthma has ranged from 7 to 54 in Montana[7] (Figure).



*Based on 21 sites where air quality data have been collected

Table 5. Air Quality Index (AQI) Table			
AQI Values	**Levels of Health Concern**	**Health Message**	**Colors**
0-50	**Good**	**Air quality is considered satisfactory, and air pollution poses little or no risk**	**Green**
51-100	**Moderate**	**Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution**	**Yellow**
101-150	**Unhealthy for Sensitive Groups**	**Members of sensitive groups my experience health effects. The general public is not likely to be affected**	**Orange**
151-200	**Unhealthy**	**Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects**	**Red**
201-300	**Very Unhealthy**	**Health alert; everyone may experience more serious health effects**	**Purple**
301-500	**Hazardous**	**Health warming of emergency conditions. The entire population is more likely to be affected.**	**Maroon**

Outdoor Asthma Trigger Mitigation

- Decrease the level of exertion or length of the outdoor activity on days with poor outdoor air quality. Increased intensity and exposure increases the chances of being affected by air pollution.
- Schedule outdoor activities for morning or evening when ozone levels are usually lower.
- Avoid sustained contact with vehicle exhaust emissions. Schools and childcare facilities should consider 'no idling' policies for school buses and other vehicles.
- Maintain a good indoor air quality by keeping windows and doors closed or using an air cleaner or purifier when outdoor air quality is compromised. Consider leaving the area if air quality is poor for a long period.

Clinical Recommendations

- Screen for exposure to environmental allergens and irritants. Review exposure history; including key household members if possible. Example history form: http://www.neefusa.org/pdf/AsthmaHistoryForm.pdf
  Taking an Environmental History: http://www.neefusa.org/pdf/EnvhistoryNEETF.pdf
- Educate patients and family members about common environmental triggers that exacerbate asthma symptoms, increase risk of asthma attacks, and lead to persistently poor disease control.
- Routinely review environmental triggers and remediation plans with patients.
- Identify specific triggers associated with exacerbation or worsening of asthma symptoms like unscheduled medical or emergency department visits and need for oral steroids.
- Recommend specific steps to mitigate or remove environmental triggers from the patient's daily physical environment.
- Reinforce to patients the health benefits, improved disease control, and improved quality of life that can be had by avoiding their asthma triggers.
- Provide educational materials and referral information to patients.
- Promote the use of DEQ's 'Today's Air' website (todaysair.mt.gov) to assess outdoor air quality near a residence or activity location.
- Access experts on pediatric environmental health problems by contacting the Rocky Mountain Region Pediatric Environmental Health Specialty Unit (PEHSU) at 1-877-800-5554 or www.rmrpehsu.org.
- Contact the Montana Asthma Control Program for support or documents pertaining to environmental asthma triggers at 406-444-7304.

References

1. American Academy of Pediatrics Committee on Environmental Health. "Pediatric Environmental Health". 2nd ed. Elk Grove Village, IL: American Academy of Pediatrics; 2003.
2. National Heart lung and Blood Institute (US). Expert Panel Review-3 Guidelines to Asthma Management. National Institutes of Health (US); 2007 Aug. NIH Pub. Available at: http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf
3. Agency for Toxic Substances and Disease Registry. "Case Studies in Environmental Medicine: Environmental Triggers of Asthma." www.atsdr.cdc.gov/csem/asthma/. Web Oct 17, 2007. Accessed March 22, 2010.
4. Current asthma is assessed by responding yes to the questions:
   Have you ever been told by a doctor, nurse, or health professional that you had asthma? and Do you still have asthma?
   -or- Have you taken asthma medication in the last year? -or- Have you had asthma symptoms in the last year?
5. Klepeis N, Nelson W, Ott W, *et al.* The National Human Activity Pattern Survey: A Resource for Assessing Exposure to Environmental Pollutants. *J Exposure Analysis and Environmental Epidemiology* (2001) 11, 231-252.
6. Institute of Medicine. "Clearing the air: Asthma and Indoor Air Exposures". Washington DC: National Academy Press. 2000. Print.
7. Environmental Protection Agency. "Asthma and Outdoor Air Pollution". airnow.gov/index.cfm?action=pubs.index. Web Jan 26, 2010. Accessed April 5, 2010.
8. Environmental Protection Agency. "Compare My Air." www.epa.gov/aircompare/comare.htm. Web Feb 25, 2010. Accessed March 22, 2010.

Quarterly Surveillance Report

MONTANA ASTHMA CONTROL PROGRAM

April-June 2010

LOOK INSIDE FOR INFORMATION ON:

- Common indoor and outdoor asthma triggers
- Number of unhealthy air quality days in Montana
- Reported frequency of exposure to asthma triggers and mitigation efforts among Montanans with current asthma
- Suggestions for avoiding indoor and outdoor asthma triggers

The Montana Asthma Control Program is funded through the Montana State Legislature and the Centers for Disease Control and Prevention. The goal of the program is to improve the quality of life for all Montanans with asthma. For more information, visit our website at http://dphhs.mt.gov/asthma

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